W5YI

Nation's Oldest Ham Radio Newsletter

REPORT

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★ *In This Issue* ★

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FCC PROPOSES HAM BAND SPECTRUM SHARING

Three FCC Public Notices were issued during the past couple of weeks which underscores the fact that we as amateurs should get used to the idea of sharing spectrum with other services. Actually most VHF and higher frequency spectrum is shared. The three news items that the FCC released concern the 1.25 meter, 70-cm and 33-cm ham bands.

Allocation of 219-220 MHz for use by Amateurs

Everyone is well aware that, until August 1991, the Amateur Service had access to the entire 220 to 225 MHz band on a secondary basis. The FCC separated this shared spectrum into two exclusive segments. The primary reason given was to accommodate new narrow-band technology which would not be compatible with amateur operations.

The Land Mobile Service got the 220-222 MHz portion for narrow-band business radio. Ham radio was allocated the remaining three megahertz, 222-225 MHz. The biggest loss was at 220.5 to 221.9 MHz which amateurs used for control links. They were also beginning to establish an intercity packet radio network in this band.

Packet radio signals are used to transmit digital data in groups or packets using a specified format. Radio channels used by these systems are occupied only during the time individual packets of data are actually being transmitted. Upon completion of a transmission, the channel becomes available for other traffic.

Amateurs use packet radio for transmitting a variety of information, including (1) graphic images, (2) computer programs, (3) messages and (4) data bases. These systems can also be used in times of emergency when other communications facilities are out-of-service or overloaded to efficiently carry a large volume of messages. Amateur radio operators plan to use wideband backbone packet radio networks to provide intercity links of their local packet radio systems.

ARRL petitions for 216-220 MHz access

According to the American Radio Relay League, "The loss ...left the Amateur Radio Service without a reasonable substitute for such high-speed links, and the development of a truly unique nationwide communications system with unparalleled emergency preparedness and national defense capabilities."

The FCC received more than 550 requests in 1991 asking that they review the 220-222 MHz reallocation. In response to these *Petitions for Reconsideration,* the FCC said they thought that in certain areas of the country, some relief was indeed justified. They said the Commission would entertain a request for replacement spectrum and asked ARRL to make a specific proposal showing how amateur operations could use shared

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spectrum without causing interference to existing users.

After considerable amateur and professional testing, the American Radio Relay League filed a petition with the FCC, They asked for access to 216 to 220 MHz on a shared basis to "...provide reaccommodation for ...present and future wideband date intercity links and other point-to-point fixed amateur stations... displaced from the 220-222 MHz band." ARRL said it was not possible to relocate displaced data operations at 222-225 MHz due to the existence of extensive 1.25 meter repeater networks.

The 216 to 220 MHz band is primarily allocated in the United States to the Maritime Mobile Service. The *Automated Maritime Telecommunications System* (AMTS) operates 80 channels on this spectrum. To reduce interference, the League agreed that amateur activity at 216 to 220 MHz should be managed. A power level of 50 watts was suggested as well as specific frequency coordination. "The absolute responsibility to avoid interference would be placed on the amateur service licensee," ARRL said.

On March 5th, the FCC released a bulletin stating that it would adopt a *Notice of Proposed Rule Making* to provide "...a secondary allocation for the Amateur Service in the 219 to 220 MHz band to be used for amateur auxiliary station (point-to-point) packet backbone networks and other amateur point-to-point fixed communications."

The Commission also recommended operating limits and other measures to ensure that these amateur operations do not cause interference to primary operations in and adjacent to the 219-220 MHz band. We will not know the extent of these controls until the exact text of the NPRM is issued.

The 219 to 220 MHz spectrum was selected since the FCC (last year) allocated the 218 to 219 MHz band to a radio-based two-way *Interactive Video and Data Service*. The 20-watt IVDS provides information, products and various other services to consumers and accepts their interactive responses. IVDS is delivered by video ...including cable, broadcast TV, and direct broadcast satellites. (216 to 218 MHz was not practical for ham sharing due to its close proximity to TV Channel 13.)

The FCC "...believes this action will foster technological experimentation and innovation, particularly with higher data rates, ...facilitate the construction of a nationwide packet data backbone network [and will] "...relieve congestion in the 222-225 MHz band in certain geographic areas."

The FCC concludes that "...the amateurs' ability to perform interference analysis, the directional nature of the proposed services, and the secondary status of this proposed allocation should adequately protect all primary and existing secondary operations in and adjacent to the 219-220 MHz band." The Commission has asked the public to comment on the proposal.

FCC to Allocate 449 MHz for Wind Profiler Radars

On March 10th, the FCC proposed to allocate the 449 MHz band for wind profiler radar systems and asked the public whether they should be accommodated in the 915 MHz (ISM) band as well. This really was not a surprise since the government has been investigating several VHF and UHF homes for wind profilers for several years now.

The first thing that comes to mind to most of us is that 420 to 450 MHz is allocated to the Amateur Service. And does this mean that the Amateur Service is losing access to more spectrum? The answer is no! We must remember that Amateur Radio uses the 70-cm ham band on a secondary basis. What it does mean is that we will be gaining another sharing partner.

The primary user of the 420-450 MHz band is Government Radiolocation. Government frequencies are assigned by the NTIA (National Telecommunications and Information Administration) and not the FCC. First, let's examine exactly what are wind profilers.

Wind profilers are sensitive, ground-based pulsed radars that measure wind speed and direction in real-time at a variety of altitudes between 1500 and 53,000 ft. This is the altitude flown by the nation's airliners.

Basically, upper altitude wind profiles are obtained by processing a return Doppler radio signal. This information has many applications, including detection of severe wind conditions and planning flights in aviation; improving weather forecasting in meteorology; and analyzing movement of air masses carrying pollutants for environmental studies.

Currently, wind speed and direction is determined by the National Weather Service using expendable balloon-borne instruments called radiosondes. Wind profilers offer big advantages over radiosondes. They operate faster, automatically, cheaper ...and do not have to be carried into the altitude by balloons.

Experimental wind profilers have been operating at 404 MHz, but are interfering with certain satellite uplinks in an adjacent band and a new home for wind profilers had to be found. While propagation characteristics require that wind profilers operate in the 50-1000 MHz range, efforts to find spectrum for wind profilers have focused around 200-500 MHz; specifically 216-225 MHz, 400 MHz and 420-450 MHz. At 216-225 MHz there was a concern about possible

interference to TV channel 13 which is located at 210-216 MHz ...and to the Maritime Mobile Service (216-220 MHz). The 50 MHz and 900 MHz band also were extensively considered.

NTIA noted that the 420-450 MHz band is allocated on a primary basis to the Government Radiolocation service and is the only 30 MHz of spectrum available for military radiolocation below 1 GHz nationally. The Amateur Service uses 420-450 MHz on a secondary basis.

An NTIA study found that 420-430 MHz is used for Amateur TV (ATV) and by the military. The 430-440 MHz band contains many military radars and drones. In addition, the band is populated by Amateur satellite operations. The 440-450 MHz band is used the least by the government. Amateur use is for repeaters at 442-450 MHz and ATV operations at 438-444 MHz.

"To minimize the impact on current military operations, a frequency near the upper and edge would be more desirable. As a result, 449 MHz (2 MHz necessary bandwidth) has been identified. ...The disadvantage of 449 MHz is the impact to the amateur's repeater operations in the 442-450 MHz band," the NTIA report said.

Consideration for wind profiler operations was given to 441 MHz, but the Government concluded that this frequency has a larger potential to adversely impact U.S. military operations. NTIA acknowledged the heavy amateur repeater usage between 442 and 450 MHz. Depending upon local usage, approximately 80 repeater channels have 70-cm repeater inputs and outputs between 448 and 450 MHz.

NTIA is now recommending that wind profilers be accommodated at 449 MHz. Since the FCC regulates amateur spectrum use, they have now adopted an NPRM proposing 449 MHz for wind profiler radars.

The good news is that the impact on the Amateur Service should be minimal. Wind profiler radars are generally located in remote rural locations and not near the 30-mile radius of most 70-cm repeaters located in population centers.

Furthermore, the government has agreed to take whatever steps they can to minimize the impact of wind profilers on existing amateur repeater users. And installation of the wind profiler network is not expected to begin for another five to ten years. That will allow plenty of time for repeater owners and wind profiler planners to determine what steps need to be taken to minimize interference to one another.

New Location and Monitoring Service at 902-928 MHz.

The 33-cm ham band at 902-928 MHz is admittedly lightly used by the Amateur Service. Theoretically, FM repeaters are supposed to be operating on the band with inputs at 906-909 MHz, matched with 918-921 outputs. Amateur TV and packet operation also have extensive ham band-planning at 33-cm. For the most part, however, 902-928 MHz is not used by the ham community ...understandable when you consider the complex band allocations and restrictions.

Internationally, the 33-cm band is allocated to the Fixed Service on a primary basis with Amateur, Mobile and Radiolocation secondary. The pecking order is slightly different in the United States where the primary users are Government Radiolocation and ISM (Industrial, Scientific and Medical) use. ISM bands are often referred to as "junk" bands since they provide a home for almost any device that radiates energy. Even microwave ovens cook on 915 MHz.

The U.S. delegation said at the last World Administrative Radio Conference that the 33-cm band would also be used in the United States for Automatic Vehicle Monitoring. Amateurs are secondary users of 902-928 MHz "...subject to not causing harmful interference to the operations of Government stations authorized in this band or to Automatic Vehicle Monitoring (AVM) systems. Stations in the Amateur Service must tolerate any interference from the operations of ISM devices." (That quote is right from the Part 2 Frequency Allocations.}

So the 33-cm band hierarchy goes like this: ISM, Government Radiolocation, AVM, Amateur and last; Part 15 Miscellaneous Radio Frequency Devices. While it appears that just about anything can operate at 902-928 MHz; it is important that amateurs recognize that ISM, Radiolocation (radar) and AVM have priority.

On March 11th, the FCC said they would be permanently allocating shared use of 902-928 MHz to Automatic Vehicle Monitoring (AVM) systems. "The proposed allocation would replace existing interim rules adopted in 1974, thereby creating a more stable environment for AVM systems to operate," FCC said.

AVM systems are used to locate and track vehicles using non-voice methods, and to relay information to and from vehicles. The Commission said these systems will likely constitute important components of the future *Intelligent Vehicle Highway System* (IVHS) and facilitate tracking of cargo in the trucking, railroad and maritime industry. (See special report on "Smart Highways" on page 10)

The FCC proposed to expand the service to encompass location of all objects, animate and inanimate, and to allow licensees to provide service on a private carrier basis to individuals, the Federal Government and business band users.

The AVM Service will be renamed the *Location*

and Monitoring Service (LMS) which the FCC defines as the use of non-voice signalling methods from and to radio units to make known the location of such units. "LMS Services will greatly benefit the public interest by promoting more intelligent use of our nation's highways and more efficient use of scarce resources," FCC said in a news release.

LMS units may also transmit and receive status and instructional messages related to the units involved. The FCC said that this definition will give licensees the flexibility to use LMS systems to monitor and locate any object and will greatly expand the potential uses for such systems. The FCC asked the public to comment on whether LMS systems and others using the band will be capable of handling any congestion.

The FCC suggested that wide-band LMS systems be licensed on the 904-912 and 918-926 MHz bands and narrow-band LMS systems at 902-904, 912-918 and 926-928 MHz. The Commission believes that wideband systems are capable of operating in a shared environment, but asked if there is a need to provide spectrum exclusivity for some period of time.

Amateur frequency sharing requirements

Sharing our spectrum with other radio services and the U.S. Government is covered in the Amateur Service Part 97 rules at Section §97.303. Since the Amateur Service is a secondary user of all UHF and higher frequency spectrum, we simply have to accept any interference that might be generated by those services designated as primary and we must not interfere with their operation.

NEW GUIDELINES PROPOSED FOR EVALUATING ENVIRONMENTAL RF RADIATION

The Federal Communications Commission has issued a *Notice of Proposed Rule Making* stating that it will use the RF guidelines adopted last year by the *American National Standards Institute* (ANSI) and the *Institute of Electrical and Electronic Engineers, Inc.* (IEEE) as their standards for evaluating environmental radiofrequency (RF) radiation from FCC regulated transmitters.

The Commission's proposal is the result of several months of evaluation and review by FCC staff. Under the *National Environmental Policy Act of 1969,* the Commission is required to consider environmental effects when performing its licensing and regulatory functions. However, the Commission is not a proficient health and safety agency and must, therefore, rely on expert organizations for guidance on appropriate standards to use. The new guidelines were developed to replace those previously used by the FCC for environmental evaluation.

The new standards differ significantly from those they replace. For example, two "tiers" of exposure levels are now recommended, one for "controlled" environments, and another, generally more restrictive, for "uncontrolled" environments. Also new restrictions are placed on currents induced in the human body by RF fields below 100 MHz.

Another significant change is the imposition of stricter limitations on automatic exclusions for low-power devices, such as hand held radios and telephones, based on operating power. The 1982 guidelines generally excluded such devices with powers of seven watts or less. The new guidelines contain more complex and more restrictive criteria for such exclusions, with allowable power decreasing as frequency increases.

The Commission's proposal will likely affect a wide variety of communications services including radio and television broadcasting, satellite mobile services, common carrier land-mobile services and private radio land-mobile services, the FCC said.

The Commission asked for comments on several issues concerning implementation and interpretation of the ANSI/IEEE guidelines.

Action by the Commission March 11, 1993, by NPRM. ***(Adapted from FCC Release, 3/11/93, ET Docket 93-62.)***

FCC Commissioner Ervin S. Duggan issued a separate statement supporting their action to update the RF radiation standards. He said "The safety of the services and facilities that we license, and the equipment we approve, are a vital concern." He stated that the agency does not have priority government responsibility for environmental RF standards, but acknowledged that the FCC "...does have an obligation to work closely with frontline health and safety agencies to ensure the safety of equipment that emits RF radiation."

He added, "...press scares and media hype are poor substitutes for the careful processes of science and government. The FCC and other government agencies, as well as the cellular industry, will work energetically to resolve questions about the safety of all RF devices. Meanwhile, it is important to keep such safety questions in perspective: Any new technology presents risks and uncertainties, which must be weighed intelligently against the obvious benefits that new technology brings. Modern life challenges us to balance those risks with courage and calm analysis, and to avoid hysteria."

[Since the text of the NPRM has not yet been released, it is not known at this point what impact (if any) the new guidelines will have on the Amateur Service which is authorized to radiate up to 1,500 watts PEP in residential areas. We will keep you posted.]

DAYTON HAMVENTION ANNOUNCES 1993 WINNERS

The Dayton HamVention Awards Committee has selected the 1993 award winners. ***Harry Dannals, W2HD,*** has been chosen **Ham of the Year**; ***Richard Jansson, WD4FAB,*** will receive the **Technical Excellence Award** and ***Robert Adams, WA9ZMO,*** has been selected for the **Special Achievement Award.**

Harry Dannals was first licensed in 1946 as W2TUK. He spent many years involved with the ARRL in almost every volunteer position. Some of the positions he held were: Section Communications Manager, Vice Director of the Hudson Division, Director of the Hudson Division, and President of the ARRL. He is currently the President of the *Quarter Century Wireless Association,* as well as a regular Volunteer Examiner. As one nomination letter mentioned, "I believe that Harry Dannals deserves this award for the leadership he provided as President of QCWA in the effort to create a no code license." Harry's contribution to amateur radio has spanned over thirty years and his tireless dedication to the hobby is admirable.

The **Technical Excellence Award** will be presented this year to ***Richard Jansson, WD4FAB.*** Dick has been an ARRL Technical Advisor for ten years and was selected for this award for his ongoing work in the development of amateur radio satellites and the design phase of the IIID bird. He has contributed a great deal to the thermal design of OSCARs 10 and 13. Dick was also responsible for most of the mechanical and thermal design work on the Microsats.

Robert Adams, WA9ZMO, earned his place in *The Guiness Book of World Records* by running 3,328 phone patches between January 9 and May 11, 1991. As a highly decorated Vietnam veteran, Robert wanted to help out in any way possible during Operation Desert Storm. His love of amateur radio was an obvious choice, so he immediately volunteered for Army MARS. These outstanding accomplishments have earned him a Presidential citation, the Distinguished Civilian Service Medal, a rare civilian award of the Legion of Merit, the 1992 Michigan Veteran of the Year ...and various other federal, military and state acknowledgements. Added to this collection will be the Dayton HamVention **Special Achievement Award** for 1993.

These amateurs will receive their awards at the annual HamVention banquet on April 24, 1993. This year's banquet speaker will be ***Cliff Stoll, K7TA.*** He is author of *The Cuckoo's Egg* - which is about his adventures in catching a computer hacker.

As always, HamVention, will be held the last weekend in April. (April 23, 24 and 25.) Sponsored by the Dayton Amateur Radio Association, it is the nation's largest gathering of ham radio operators!

JANUARY VE PROGRAM STATISTICS

January		*1991*	*1992*	*1993*
No. VEC's		**18*	**18*	**18*
Testing Sessions		*381*	*709*	*681*
VEC	*1991*	*1992*	*1993*	
ARRL	35.4%	40.2%	54.0%	
W5YI	42.0	42.3	32.0	
CAVEC	6.0	3.8	3.4	
WCARS			2.9	
GtLakes	4.7	4.1	1.5	
Others (14)	11.9	9.6	6.2	
Year-to-Date Sessions		*381*	*709*	*681*
Elements Administ.		*5838*	*13650*	*10835*
VEC	*1991*	*1992*	*1993*	
ARRL	37.0%	43.3%	58.1%	
W5YI	36.8	35.2	25.0	
WCARS			3.5	
CAVEC	6.3	2.9	2.4	
GtLakes	3.7	3.6	2.1	
Others (14)	16.2	15.0	8.9	
Year-to-Date Elements		*7329*	*5838*	*10835*
Applicants Tested		*3614*	*7946*	*6432*
VEC	*1991*	*1992*	*1993*	
ARRL	36.5%	42.8%	57.4%	
W5YI	37.3	36.7	25.6	
WCARS			3.6	
CAVEC	5.4	2.9	2.4	
GtLakes	4.6	3.3	2.1	
Others (14)	16.2	14.3	8.9	
Year-to-Date Tested		*3614*	*7946*	*6432*

January	*1991*	*1992*	*1993*
Pass Rate - All	62.4%	66.7%	65.5%
Applicants/Session	9.5	11.2	9.4
Elements/Applicant	1.6	1.7	1.7
Sessions Per VEC	21.2	39.4	37.8

Administrative Errors by VE's/VEC's			
January	*1991*	*1992*	*1993*
Defect. Applications	0.6%	0.6%	0.4%
Late Filed Sessions	2.1%	3.2%	3.4%
Defective Reports	0.0%	0.3%	0.1%

(*) Note: The January VE program statistics confirm that the initial surge to obtain No-Code Technician licenses is apparently over. There were 20% less applicants examined in Jan. 1993 versus Jan. 1992. (There still was 78% more persons tested in Jan. 1993 versus Jan. 1991, a month before the No-Code Tech.)

[Source: Personal Radio Branch/FCC; Washington, D.C.]

Technology Update

● Despite decades of monitoring and heavy use, one topic that engineers still have difficulty wrestling with is component failure. Why do electronic parts fail? Is there any way to predict exactly when a part will go out?

There are several reasons why it's so hard to track down the causes of electronic failures. First, a technician must determine if a part failed because of something the user did to it, or if it was just fatigue, or due to overheating, or if it was a design flaw.

Back in 1986, the U.S. Air Force set up a database to gather information about electronic failures. The goal is to determine the reasons why electronic parts fail, and to try to predict their behavior mathematically. So far, results are surprising: 50% of all failures come from inherent design flaws. Many other parts logged for failure actually test okay when returned to the manufacturer. Most of that is due to human error, or trying to make the part do something it wasn't designed to do. A part may work fine by itself, but it behaves strangely when installed in a circuit board with other components.

Perhaps the biggest cause for electronic component failure is our old friend, the cold solder joint. The part works fine, but because of poor soldering it makes poor contact with the circuit board. One reason for this is the inherent problem with solder: at room temperature it deforms easily, because its melting point is so low. Temperatures within electronic equipment can easily reach 200°F, thus causing solder joints to crystalize and change their properties. Another reason is that parts expand when they heat up, but the circuit boards do not. The junction between them is the solder joint. Use fans if you've got 'em.

And speaking of fans, have you noticed that those box fans mounted inside every PC power supply continue to shrink. Muffin fans 40 millimeters by 15 millimeters (about the size of a matchbook!) are now available for about the same cost as ordinary fans. The 12-volt brushless DC motors were originally designed to keep the latest generation of microprocessors cool. But doubtless hams can find plenty of other uses for them!

● Environmental politics may some day require manufacturers to be responsible for proper disposal of their products. When the product reaches the end of its life, the company that built it must find a proper final resting place for it. So if it is possible to recycle the product, the company will probably do so (it's cheaper).

One item already undergoing recycling is the Cathode Ray Tube (CRT), used in almost every television, computer monitor, and oscilloscope today. Over 200 million CRTs live in the United States alone. And when they finally blow out, most people just heave them into the trash. That's dangerous; CRTs contain lead, and they can also go off like bombs when mishandled. CRTs must be disposed of in official hazardous waste areas, stored in underground cement bunkers lined with rubber to prevent the lead from polluting the water table.

Several companies are rebuilding and recycling CRTs. They carefully break the vacuum seal, saw off the glass neck, and extract the electron guns for their metals. The phosphor coating is also recovered for recycling. The special glass is then crushed and melted into new glass. This process can handle any type of CRT, large or small, color or monochrome.

● The Electric Glass Bomb. In the early days of television, all cathode ray tubes (CRTs) had faces that were perfectly round. Oscilloscopes with round CRTs still show up at hamfests. Then the face shape turned roughly rectangular. Even so, looking at an everyday CRT from a side view, you notice that the face has a gradual curve to it. That is, a CRT can't stand up on its face because it isn't flat; it's curved. Why? Because a CRT is made of glass and a lack of air. It's a giant vacuum tube. (Remember vacuum tubes? They kept the shack warm on cold nights and exploded like firecrackers when they rolled off the workbench.)

The move now is to make flat-faced picture tubes. With high-definition television (HDTV) just around the corner, and other video formats whose height-width ratio require very wide rectangular viewing areas, flat picture tubes fit the bill better. But they are tough to make. For one thing, the additional stress on the glass because of the flat surface means the glass must be thicker (and therefore heavier). Another reason involves a thin metal sheet planted against the inside face of the CRT. It's called a shadow mask; its duty is to make sure that the three video images from the three color guns (red, green, blue) do not interfere with each other. But, fortunately, Zenith has already developed a special kind of shadow mask expressly for flat CRTs. It allows for smaller phospor dot sizes, pushing up the resolution of video screens even higher.

● You may have used modern amateur radio equipment that automatically retunes the antenna when changing bands. Two researchers at the University of Stellenbosch in South Africa have developed a miniature loop antenna (meant for VHF and UHF operation) that automatically retunes itself, even when changing frequency.

The problem with loop antennas is their instability and narrow bandwidth. Though highly directional, their resonant frequency can be affected by changes in temperature, and even the passing by of metallic objects. Just walking down the street with a loop antenna on an HT would result in a wide range of resonant frequencies.

This new loop antenna utilizes a feedback-loop system. It monitors the incoming transmission frequency and compares it to the loop's resonant frequency at that moment. The

feedback loop electronically changes the loop's capacitance to bring the antenna back into tune. That is done with a varicap diode.

● Threading the needles. If you think the wires inside your HT are small, count your blessings. The NEC Corporation in Tokyo, in doing semiconductor research, recently discovered how to make the smallest wires known: only a few atoms across. That figures to about one and a half nanometers, or one and a half thousandths of one millionth of a meter. The smallest wires commercially available are thousands of times larger.

In addition, these microwires are not manufactured directly. They are formed by depositing lead vapor inside miniature pipelines made of carbon. The inventors say the only downside so far is that they aren't sure yet if these microwires can actually conduct electricity well. But if they do, you can be sure that computer circuits will shrink even more.

● The Art of Not Being Seen. In wartime, the scenario is this: "If you can see it, you can hit it; and if you can hit it, you can wipe it out with a single shot." So the object is to avoid detection. An episode of Nova a few years ago on PBS covered some of the methods of making objects radar-resistant.

From a radar's point of view, an old-style plane is an easy target. Radar is made up of radio waves, and radio waves concentrate on sharp objects (this is why a car radio antenna has a metal sphere on the tip; it keeps down static). The more sharp objects, the more visible the target.

But if a plane is made with material that can absorb RF energy instead of reflecting it, the radar never sees it. It is far cheaper to cover an old plane with RF-absorbing material than to build a new plane from scratch out of it. One of the most visible radar targets is the cockpit canopy. A mixture of special polymers that can store electricity sprayed onto a surface does the trick after it hardens.

● So you want to fly an experiment aboard the Space Shuttle? NASA's rules governing how and where it can fly may look complicated. Assuming that NASA approves it, it still must be okayed by the astronauts on the flight (they pretty much have the final say in what they will or won't participate in). If a project gets that far, it must satisfy the following requirements:

- It must fit into a standard Shuttle locker (10" x 17" x 20").
- It cannot weigh more than 54 pounds.
- The center of gravity must be as far to the back of the locker as possible.
- Electrical requirements must not be more than 28 volts DC, 5 amperes maximum. If AC is required, 115 volts AC is available at 400 Hz, three-phase at up to 3 amperes per phase. Power consumption must be less than 115 watts for up to eight hours.
- If it generates too much heat, a cooling fan must be installed.
- It must withstand the heavy G-forces that space travel presents.
- It shouldn't catch fire easily, and mustn't pollute the air within the crew cabin.

It's a good thing packet radio satisfies all the rules, isn't it? That's a lot of power and technology in such a small space. But give it some thought anyway; somebody, somewhere, at some point in time said, "Hey, why not try flying packet radio on the Shuttle?" One of your ideas could ride the bird into orbit someday. After all, a bunch of California hams built the first OSCAR inside a garage. Why not you?

● Airplanes racing along over the world's oceans like to fly at higher-than-normal altitudes because engine efficiency is higher there. But to change altitude, the pilot must receive permission from flight controllers. Being able to talk to a flight controller while you're several hundred miles away over the ocean is not always possible.

Listen to a scanner radio tuned to the air-traffic-control frequencies at the nearest airport. Those channels are more jammed than the busiest repeater. Is there some way to cut down on the chatter?

There will be, very soon. Satellites orbiting the Earth will be brought into service as relay links between airplanes and ground stations. The additional information-transmission capability will allow more than just voice; digital data can be exchanged as well. It is predicted that such a digital link will eventually replace voice-based message traffic. This new digital link is called Mode S.

● Airlines apparently have thrown in the towel when it comes to preventing passengers from using radios while on-board. Since the local oscillators in lesser-quality transistor radios do not have adequate shielding, they wreak havoc on the sensitive navigation equipment in the cockpit. Trying to keep fliers from listening to a radio is not easy.

The solution appears to be giving the customers what they want, but not the way they want it, however. Logic decrees that if they want radio, they will get it from radios owned and operated by the airlines. That way, passengers can listen to their music and the airlines can rest satisfied in the knowledge that the FCC-FAA-approved radios won't foul up the flight computers. The ABC Radio Network has teamed up with the Harris Corporation to provide this service, using satellites and ground stations to beam dedicated FM broadcasts to these specific receivers kept on-board the airplanes.

● If you use a PC-XT computer or PC-XT clone and want to upgrade your Microsoft DOS operating system to version 5.0, you should know that most of these machines use only low-density disk drives. Most 5.0 upgrades are available only on high-density disks, meant for AT-class machines. When you go shopping, be sure to ask the clerk for the low-density version of MS-DOS 5.0.

• Ordinarily we would be writing this newsletter the last weekend of the month, but since the Dayton HamVention falls on the last weekend of April, we have moved our March and April writing schedule back one week. (We will be in HamVention booth No. 429, by the way.)

We had hoped to cover the STS-55 launch and ham radio activities aboard the Space Shuttle Columbia in this issue but the mission has been delayed again (one day to March 22nd at 14:51 UTC - weather permitting) ...too late for this "early" April 1st issue.

STS-55 is the first of several SAREX (Shuttle Amateur Radio Experiment) flights planned for 1993. The STS-55 mission, designated SL-D2 (Spacelab Deutsche-2), represents the second in a series of dedicated flights for Germany. The primary goals of the mission are to perform studies in materials and life science research. A nine day flight is planned.

The seven person crew on STS-55 includes ham radio operators ***Steve Nagel N5RAW, Jerry Ross N5SCW, Charlie Precourt KB5YSQ, Hans Schlegel DG1KIH*** and ***Ulrich Walter DG1KIM.*** SAREX operations on this flight are 2-meter FM voice and packet. The primary voice callsign will be N5RAW. The packet radio callsign for all SAREX missions is W5RRR-1. The voice and packet downlinks for the SAREX station are on 145.550 MHz.
DO NOT TRANSMIT ON THE DOWNLINK FREQUENCY!

Uplinks are:	Voice	Packet
Europe:	144.80	144.49
(MHz)	144.75	
	144.70	
Rest of World:	144.99	144.49
(MHz)	144.97	
	144.95	
	144.93	
	144.91	

For all operations, Earth stations should listen to the downlink frequency and transmit only when the Shuttle is in range and the astronauts are on the air. Listen for any instructions from the astronauts as to specific uplink frequencies in use during the current pass. Also, listen to the uplink frequencies before transmitting to avoid interference to other users.

In addition to the U.S. SAREX ham gear in the Shuttle mid-deck, an additional ham radio station will be flown in the German spacelab module. This station, designated SAFEX (for Spacelab Amateurfunk-Experiment), includes a 2-meter FM downlink and 70-cm FM uplink capability. A dualband (2-meter/-70-cm) external antenna, mounted on the German spacelab module, will be used for SAFEX contacts. Payload Specialists Schlegel and Walter expect to make a few scheduled contacts with European schools with this equipment.

The externally mounted SAFEX antenna gives the SAREX team an opportunity to compare the performance of the U.S. SAREX window mounted antenna to an externally mounted antenna. A special A/B antenna test is planned on orbits 61 and 62 using the normal SAREX downlink frequency, 145.550 MHz. During orbit 61 the crew will transmit using the SAREX window antenna and on orbit 62 the crew will use the SAFEX external antenna. Individuals in the Southeastern U.S. are welcome to help participate in this test by taking signal strength readings of the received signal for both orbit passes. If the shuttle is well above your horizon (greater than 10 degrees) for both passes, see page 42 of the Feb. 1993 QST to learn more details.

The next SAREX flight will be STS-56 aboard the shuttle "Discovery", presently due for liftoff on April 7th. All five astronauts on that mission have ham tickets: ***Ken Cameron KB5AWP, Ken Cockrell KB5UAH, Ellen Ochoa KB5TZZ, Mike Foale KB5UAC,*** and ***Steve Oswald KB5YSR.*** That mission features a high inclination orbit which will yield much better coverage for the high latitude cities in North America. STS-56 will carry configuration "D" which includes 2-meter FM voice, packet, SSTV and 70-cm ATV (receive only.)

Then comes STS-57 with astronaut ***Brian Duffy, N5WQW,*** aboard "Endeavor." That 7-day mission was originally set for April 28th but will be delayed until May.

The August 25th STS-58 mission was not originally scheduled to be a SAREX flight, but it now appears ham radio will be aboard! One of the astronauts on that flight, ***Bill McArthur,*** passed his ham exam requirements on March 9th at a W5YI-VEC test session held at the Johnson Space Flight Center. The November STS-60 space mission (with Russian cosmonauts aboard) is also rumored to be a SAREX flight.

That makes three ...and probably five space shuttle flights that will fly this year with ham radio operator/astronauts! All missions will feature school contacts as well as FM packet and voice QSOs with the general amateur radio population.

A special QSL card is available to those who hear or work the Space Shuttle. The IBM Amateur Radio Club (P.O. Box 1328, Boca Raton, FL 33429-1328) is the official SAREX QSL Manager. A large self-addressed stamped envelope is required with the notation: "STS-55 SWL" or "STS-55 2-Way" on the front. Be prepared to wait a while to receive the QSL since it takes a month for the mission photos to be made available to the SAREX team - one of which will appear on the QSL. Reviewing the audio tape can take 2 to 3 months.

WA3NAN, Goddard Space Flight Center ARC (Greenbelt, MD), will continuously broadcast live space shuttle air-to-ground audio on 3860, 7185, 14295, 21395 and 28650 kHz ...and on 147.45 MHz on VHF-FM in the Washington, DC area. W5RRR (Johnson Space Flight Center ARC) will use 3850, 7227, 14280, 21350 and 28400 kHz ...and 146.64 MHz on VHF in the Houston, Texas, area.

• The FCC has determined that since an Amateur Radio station need not be operated at the station address, there is ***no need for a separate station address to be shown on the operator/station license application Form 610.***

Effective March 1, 1993, the FCC is ***eliminating the amateur radio station address*** on both the Form 660 (Amateur Radio license) and Form 610 (Amateur Radio application.) The only applicant address required is the current mailing address on Line No. 7.

It is no longer necessary for ham radio license applicants to show a station address on the Form 610 application at all. We were told that the FCC will no longer even look at Line 2H (Change Station Address) or Line 8 (Current Station Location) on the application Form 610. "Any address - or no address - entered there is O.K." Although future versions of application Form 610 will have these two lines eliminated, the current version may be used indefinitely.

• MCI-Mail, the popular electronic mail service of ***MCI has established a new direct link to the White House*** for its users. You can send an MCI message directly to President Clinton by simply typing in "White House". And you will get an answer if you so request!

Users can also read 5 classes of presidential news releases (Economic, Foreign, News, Social and Speeches) on a special Bulletin Board that MCI has set up by typing in "View White House." But the service is not free! Cost is 30¢ a minute while "on-line."

• The NTIA *(National Telecommunications and Information Administration)* and not the FCC will ***lead the effort to build a national broadband "superhighway" for information exchange.*** NTIA was chosen (rather than the FCC) since it is under the direct jurisdiction of the White House. The FCC is an independent agency not under the administration's control!

• ***The American Radio Relay League has filed comments opposing a petition for rule making*** by Cornell University seeking to initiate a notification procedure on new and modified radio facilities in Puerto Rico because they might interfere with future radio astronomy operations at the Arecibo Observatory.

The League "does not dispute the need to protect the observatory from actual harmful interference" but says "A better procedure would be for Cornell to work cooperatively with the local repeater or frequency coordinator in Puerto Rico who can assist in identifying and resolving any interference complaint."

• ***Northwest Airlines issued a press release stating they will allow passenger use*** of electronic calculators, portable computers (with no peripheral devices), portable tape players and electronic games on their flights, but not portable cellular phones, remote controlled toys, CD players, FM radio receivers and 2-way radios. Northwest is the nation's 4th-largest airline.

• A Renton, Washington, company has developed a ***condom-like device to protect users from cellular telephone radiation*** entering the skull. "Cellguard" fits over the antenna and earpiece to redirect radio waves away from the head.

• Community Video Associates, Inc. (CVA) has taken over production of satellite radio's ***"This Week in Amateur Radio"*** program which airs each Saturday afternoon at 5:00 p.m. (Eastern time) over the Spacenet 3 satellite, transponder 21, 5.8 MHz wideband audio. Host and Executive Producer, ***Stephan Anderman, WA3RKB,*** is also an ARRL Hudson Div. Asst. Director.

• ***Weird advertising medium,*** Part 2! Remember we told you several months before it happened that NASA would be selling advertising space on its rockets?

Now comes word that a Swiss-based outfit called "High Adventure" plans to sell advertising space on a 10-million cubic foot balloon ("taller than the Statute of Liberty") that will be launched over Texas late next year. A sky diver will bail out over Texas and free fall for 23-miles (5 minutes) at speeds breaking the sound barrier. The documentary, "Sky Dive from Space" is budgeted at $5.3 million!

• The ARRL's Spectrum Management Committee met in Nashville, TN, to ***review the process of developing ARRL-recommended band plans.*** It was agreed that preliminary band planning should be developed and published for the affected community to consider. All input will be carefully evaluated. An Ad-Hoc committee appointed by the League president would present their band-planning recommendations to the Board.

The Spectrum Management Committee voted to dissolve both the VRAC and VUAC and replace them with a single 16-member advisory committee which would have no band-planning function. The ARRL Board will make the final determination.

• ***Michael C. Trahos, KB4PGC,*** of Alexandria, VA, has filed a *Motion to Dismiss Late Filed Comments* by ***Kenneth A. Piletic, W9ZMR,*** (Extra Class) of Streamwood, Illinois.

Piletic objects to the NPRM (PR Docket 92-289) which would allow Novice Class operators to construct, install and maintain Amateur Radio repeaters.

He argues that Novice licensees do not possess the necessary technical qualifications or experience. "Novices who believe they are qualified need only to upgrade to the next higher class of license. The examination for Technician consists mainly of technical questions dealing with exactly this situation."

Trahos contends the Piletic comments were filed more than a month after the cutoff date and, by law, may not be considered.

INTELLIGENT VEHICLE HIGHWAY SYSTEMS
Smart Highways of the future...

As mentioned on page 3, the FCC has renamed the *Automatic Vehicle Monitoring* (AVM) to the *Location and Monitoring Service* (LMS) and said it will be located in the 902-928 MHz band. The Commission also said this service would be important to the planned ***Intelligent Vehicle Highway System***. IVHS is an acronym for the so-called "Smart Highway" ...a very futuristic concept that uses high tech electronics to manage the flow of highway traffic in cities and freeways. The objective of IVHS is three-fold ...increase highway capacity, enhance safety and reduce congestion. This will be accomplished through a network of sensors which will keep track of highway traffic volume.

Computer-controlled IVHS systems will respond to present, changing and anticipated traffic conditions by adjusting traffic lights, delivering digital information to travelers and - through navigational aids installed in the vehicle - routing drivers to reach their destination in the quickest, safest and most direct manner.

Highway use is expected to double by the year 2020 when the traffic volume will reach some 4 trillion vehicle-miles. And unless there are increased efficiencies, congestion delays will increase by 400%. This gridlock could adversely impact U.S. productivity.

The concept of "Smart Highways" was first suggested in 1987 by the Federal Highway Administration. They presided over a joint effort of government, industry and researchers to develop a plan to increase the efficiency of the U.S. highway network. This effort, called "Mobility 2000" led to a report two years ago describing IVHS ...and the formation of a group called the Intelligent Vehicle Highway Society of America.

In 1991, President Bush signed the Intermodal Surface Transportation Efficiency Act (ISTEA) into law. It authorized $660 million over six years for IVHS research, development, testing and deployment. Last summer, IVHS America submitted their 20-year plan for establishing the nation's intelligent highway system to the Department of Transportation.

How will IVHS work? In the beginning, driver's will still operate their automobiles on the highways. IVHS will serve in an advisory capacity only. Traffic will be automatically rerouted or restricted ...and driver's advised of congestion through in-vehicle displays and computer-programmed highway signs. Driver dashboard entry of destinations will assist in routing highway traffic. Ultimately, vehicles might be able to run non-stop bumper-to-bumper at high speeds using electronic collision avoidance techniques.

Radio station reporting of traffic conditions could become a thing of the past! Broadcasters report problems only after they happen. A smart highway system will anticipate trouble spots by drawing on computerized models containing historical data, weather, time of day, number of cars past a specific check point, driver behavior ...and automatically alert drivers and take corrective action before congestion can develop. In effect, the problem won't exist. IVHS will even teach itself to be smarter! Electronic road surveillance will collect and store traffic flow patterns in a database for future "modelling" use.

IVHS will simply by count and compute the speed of cars past a specific point. A sudden unexplained difference between the computer model and the actual traffic volume at a given point will indicate a traffic delay due to an accident or disabled vehicle. An immediate announcement containing rerouting information will be broadcast to vehicles containing a cellular phone or dashboard display ...and emergency vehicles quickly dispatched. And you won't have to slow down at a toll booth. IVHS counters will provide the information necessary for toll collection through automatic account debiting or later billing.

IVHS could even inform drivers of their location by showing their position on a dashboard video map. Looking for a nearby restaurant or hotel? Step-by-step instructions could be delivered to your on-board video navigation system. An IVHS bus sign will accurately display its exact time of arrival.

How will this automation be paid for? A good question ...one that has not yet been resolved. One proposal mimics the pricing scheme used by telephone companies. A driver could be charged a premium for driving at rush hour ...or even given a rebate for off-peak road use. Several states already are participating in IVHS efforts. General Motors has furnished 100 IVHS navigation and travel information system equipped automobiles for a Travtek field test in Orlando. Motorola also has developed IVHS in-vehicle gear for an Illinois "Advance" pilot program.

But the United States is not the only country working on high-tech highway management. Europe has their PROMETHEUS *(PROgraM for European Traffic with Highest Efficiency and Unprecedented Safety)* and DRIVE *(Dedicated Road Infrastructure for Vehicle safety in Europe)* programs underway. These feature collision avoidance, freeway traffic control, traveler's information and on-board navigation. Japan already has 200,000 vehicles equipped with their VICS (Vehicle Information and Communication System) and Japanese consumers are paying $3,000 for their in-vehicle navigation system. (12,000 are being sold monthly!)

What is the downside? One, certainly is individual privacy. Where you have been, where you are going ...and how fast becomes public information. And how will enforcement agencies use this information?

A sizeable investment will also have to be made by the automobile and electronics industry. It has been estimated that $200 billion will be spent on IVHS over the next 20 years ...mostly by consumers and fleet operators. How drivers will behave and cope in an information-rich transportation environment is anyone's guess.